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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/713,819	11/14/2003	Eisuke Wadahara	1402-03	2568

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EXAMINER	
PIZIALI, ANDREW T	

ART UNIT	PAPER NUMBER
1771	

MAIL DATE	DELIVERY MODE
07/06/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/713,819	WADAHARA ET AL.	
	Examiner	Art Unit	
	Andrew T. Piziali	1771	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *15-19,22 and 46* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *15-19,22 and 46* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 November 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/14/2007 has been entered.

Claim Objections

2. Claim 46 is objected to because of the following informality: the word "epoxy" is misspelled "expoxy." Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 15, 22 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,649,398 to Isley in view of USPN 4,906,506 to Nishimura in view of USPN 3,881,522 to Lewis in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol.

Regarding claims 15, 22 and 46, Isley discloses a preform comprising a thermosetting resin as a matrix resin, and a reinforcing carbon fiber substrate characterized in that said reinforcing fiber substrate includes a reinforcing fiber yarn group arranged with reinforcing fiber yarns in parallel to each other in one direction and a weft-direction auxiliary yarn group formed by auxiliary yarns extending in a direction across said reinforcing fiber yarns (see entire document including column 5, line 63 through column 6, line 19, column 9, line 38 through column 10, line 58, and Figures 8-15). Isley discloses that the auxiliary yarns may have a yield of 2 tex or less (tex = denier/9) with reinforcing yarns with a yield of between 350 to 3,500 tex (see the paragraph bridging columns 9 and 10). Isley discloses that the substrate may be used for formation of a preform in which a plurality of substrates are stacked and integrated (column 10, lines 35-42).

Isley discloses that a surface of said reinforcing fiber substrate may be coated with an interlamina-toughening resin (column 6, lines 15-19 and column 10, lines 44-58), but Isley does not appear to specifically mention a thermoplastic resin material provided at 2 to 17% by weight at least on a surface of said reinforcing fiber substrate. '506 discloses that it is known in the reinforcing fiber substrate art to include studded thermoplastic resin material in 0.2 to 10 weight percent at least on a surface of a reinforcing fiber substrate to integrally bond the substrates prior to impregnating the substrate with thermoplastic resin (see entire document including column 4, lines 6-19, column 8, line 66 through column 10, line 34, column 21, lines 9-40, and Figures 11-77). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include thermoplastic studded resin material in 0.2 to 10 weight percent at least on a surface of the reinforcing fiber substrate because the resin would advantageously integrally bond

the substrates. Regarding the resin of '506 being an interlamina-toughening resin, the current specification discloses that a resin is an interlamina-toughening resin when it is adhered to at least one surface of the substrate (see the paragraph bridging pages 49 and 50). Considering that '506 discloses that the resin adheres to at least one surface of the substrate (column 6, lines 22-39, and the Figures), the resin disclosed by '506 is an interlamina-toughening resin.

'506 discloses that the thermoplastic resin may be an epoxy resin (paragraph bridging columns 3 and 4), but '506 does not appear to specifically mention using polyetherimide, polyphenyleneether, or polyethersulfone. Yamanaka, Noland, and Voirol disclose that it is known in the FRP art to use a thermoplastic resin of polyetherimide, polyphenyleneether, and/or polyethersulfone (see entire documents including column 8, lines 10-18 of Yamanaka, column 4, lines 40-60 of Noland, and column 6, lines 15-21 of Voirol). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the resin from any suitable thermoplastic resin material, such as polyetherimide, polyphenyleneether, or polyethersulfone, because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability and desired characteristics.

The substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); In re Ruff 118 USPQ 343 (CCPA 1958). When a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result. **KSR v. Teleflex**

Isley is silent with regards to specific gap distances, therefore, it would have been obvious to look to the prior art for conventional gap distances. Lewis provides this conventional teaching showing that it is known in the unidirectional fabric art to vary the gap distance based on the desired flexibility and pliability (see entire document including column 3, lines 12-21). Lewis specifically mentions a gap distance of about 1 mm but does not limit the gap to this distance (see column 6, lines 16-33 and Figure 8). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to vary the distance between adjacent reinforcing fibers, such as from 0.1 to 1 mm, because the gap distance determines the flexibility and pliability of the fabric and because it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Regarding claim 22, Isley does not specifically mention the claimed properties, but considering that the reinforcing fiber substrate taught by the applied prior art is substantially identical to the claimed reinforcing fiber substrate (unidirectional reinforcing fiber structure comprising weft auxiliary yarns aligned in a specific orientation in a specific amount and also comprising resin in a specific shape and in a specific amount), it appears that if the composite reinforcing fiber volume fraction was 53 to 65% it would inherently possess the claimed properties.

Regarding claim 46, Isley discloses that the thermosetting resin may be epoxy resin or bismaleimide resin (column 6, lines 4-14).

5. Claims 16 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,649,398 to Isley in view of USPN 4,906,506 to Nishimura in view of USPN 3,881,522 to Lewis in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol as applied to claims 15, 22 and 46 above, and further in view of USPN 4,320,160 to Nishimura.

Isley does not appear to mention warp-direction auxiliary yarns, but '160 discloses that it is known in the reinforcing fiber substrate art to include warp-direction auxiliary yarns with weft-direction auxiliary yarns disposed on each surface of the substrate, to provide a substrate with additional strength (column 1, lines 49-57 and column 7, lines 6-18). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include warp-direction auxiliary yarns with weft-direction auxiliary yarns disposed on each surface of the substrate, as taught by '160, because the auxiliary yarns would improve the substrate strength.

6. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,649,398 to Isley in view of USPN 4,906,506 to Nishimura in view of USPN 3,881,522 to Lewis in view of USPN 4,320,160 to Nishimura in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol as applied to claims 16 and 17 above, and further in view of USPN 5,132,394 to Bockrath.

Isley does not specifically mention a sizing agent, but Bockrath discloses that it is known in the reinforcing fiber fabric art to apply a sizing agent to fibers to facilitate the weaving process and to avoid or minimize loss of fiber properties (see entire document including column 10, lines 29-38). It would have been obvious to one having ordinary skill in the art at the time the

invention was made to apply a sizing agent to the auxiliary fibers, because the sizing agent would facilitate the weaving process and would avoid or minimize loss of fiber properties.

7. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 5,649,398 to Isley in view of USPN 4,906,506 to Nishimura in view of USPN 3,881,522 to Lewis in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol as applied to claims 15, 22 and 46 above, and further in view of USPN 5,071,711 to Heck.

'506 discloses that the resin material may be studded on a surface of the reinforcing fiber substrate (column 8, line 66 through column 10, line 34 and Figures 11-77). '506 does not specifically mention the diameter of the studded resin material, but considering that '506 discloses that the fibers may have a diameter of up to 0.86 mm (column 4, lines 26-41) and considering that the studded resin material is illustrated as having a diameter less than the diameter of the fibers (Figures 11-77), it appears that '506 teaches or at least suggests that the studded resin material may have a diameter of less than 1 mm.

'506 is silent with regards to the studded resin mean height, therefore, it would have been obvious to look to the prior art for conventional resin heights. Heck provides this conventional teaching showing that it is known in the reinforcing fiber substrate art to use a resin height of from about 5 to about 80 microns (see entire document including column 3, lines 14-22). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the studded resin height from about 5 to about 80 microns motivated by the expectation of successfully practicing the teachings of '506.

8. Claims 15-17, 22 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 4,320,160 to Nishimura ('160) in view of USPN 4,906,506 to Nishimura ('506) in view of USPN 5,649,398 to Isley in view of USPN 3,881,522 to Lewis in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol.

Regarding claims 15-17, 22 and 46, '160 discloses a preform comprising a thermosetting resin as a matrix resin, and a reinforcing carbon fiber substrate comprising a reinforcing fiber yarn group (B) arranged with reinforcing fiber yarns (2') in parallel to each other in one direction and a weft-direction auxiliary yarn group formed by auxiliary yarns (3) extending in a direction across said reinforcing fiber yarns (see entire document including Figures 1-9, the paragraph bridging columns 1 and 2, column 3, lines 2-25, and column 6, lines 23-29). '160 discloses that the reinforcing carbon fiber yarns may have a yield of between 350 to 3,500 tex (column 6, lines 23-29).

'160 does not appear to specifically mention a thermoplastic resin material provided at 2 to 17% by weight at least on a surface of said reinforcing fiber substrate or the formation of a plurality of stacked and integrated substrates, but '506 discloses that it is known in the reinforcing fiber substrate art to include studded thermoplastic resin material in 0.2 to 10 weight percent at least on a surface of a reinforcing fiber substrate to integrally bond the substrates (see entire document including column 4, lines 6-19, column 8, line 66 through column 10, line 34, and Figures 11-77) and that it is known in the FRP art to laminate a plurality of stacked and integrated substrates (column 3, lines 24-34). It would have been obvious to one having ordinary skill in the art at the time the invention was made to include studded thermoplastic resin material in 0.2 to 10 weight percent at least on a surface of the reinforcing fiber substrate because the

resin would advantageously integrally bond the substrates and it would have been obvious to one having ordinary skill in the art at the time the invention was made to form the preform with a plurality of stacked and integrated substrates, motivated by a desire to increase the preform strength and/or dimension. Regarding the resin of '506 being an interlamina-toughening resin, the current specification discloses that a resin is an interlamina-toughening resin when it is adhered to at least one surface of the substrate (see the paragraph bridging pages 49 and 50). Considering that '506 discloses that the resin adheres to at least one surface of the substrate (column 6, lines 22-39, and the Figures), the resin disclosed by '506 is an interlamina-toughening resin.

'506 discloses that the thermoplastic resin may be an epoxy resin (paragraph bridging columns 3 and 4), but '506 does not appear to specifically mention using polyetherimide, polyphenyleneether, or polyethersulfone. Yamanaka, Noland, and Voirol disclose that it is known in the FRP art to use a thermoplastic resin of polyetherimide, polyphenyleneether, and/or polyethersulfone (see entire documents including column 8, lines 10-18 of Yamanaka, column 4, lines 40-60 of Noland, and column 6, lines 15-21 of Voirol). It would have been obvious to one having ordinary skill in the art at the time the invention was made to make the resin from any suitable thermoplastic resin material, such as polyetherimide, polyphenyleneether, or polyethersulfone, because it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability and desired characteristics.

Example 1 of '160 discloses that the auxiliary yarns may have 22.5 texture glass count, but '160 does not limit the yield of the auxiliary yarns. '160 is silent with regards to specific yield ranges, therefore, it would have been obvious to look to the prior art for conventional

yields. Isley provides this conventional teaching showing that it is known in the fiber reinforced plastic art to use auxiliary yarns with a yield of 2 tex or less (tex = denier/9) with reinforcing yarns with a yield of between 350 to 3,500 tex (see entire document including the paragraph bridging columns 9 and 10). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the auxiliary yarn with a yield of 2 tex or less, as taught by Isley, motivated by the expectation of successfully practicing the invention of '160 and because it is within the general skill of a worker in the art to select a known yield on the basis of its suitability and desired characteristics.

'160 discloses that gaps are present between the reinforcing fibers (see Figures 1-9), but '160 does not specifically mention the mean gap distance between adjacent fibers. '160 is silent with regards to specific gap distances, therefore, it would have been obvious to look to the prior art for conventional gap distances. Lewis provides this conventional teaching showing that it is known in the unidirectional fabric art to vary the gap distance based on the desired flexibility and pliability (see entire document including column 3, lines 12-21). Lewis specifically mentions a gap distance of about 1 mm but does not limit the gap to this distance (see column 6, lines 16-33 and Figure 8). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to vary the distance between adjacent reinforcing fibers, such as from 0.1 to 1 mm, because the gap distance determines the flexibility and pliability of the fabric and because it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Regarding claims 16 and 17, '160 discloses that the substrate may have a warp-direction auxiliary yarn group formed by auxiliary yarns (3') extending in a direction parallel to said

reinforcing fiber yarns (see Figures 1-9). '160 does not specifically mention the yield of the auxiliary yarns, but '160 does disclose that an equal number of reinforcing yarns and auxiliary yarns may be used and that the reinforcing yarns may comprise 1,000 to 30,000 filaments while the auxiliary yarns may comprise 100 to 800 filaments of substantially the same diameter (see Figures 1-9, Table 1 and column 6, lines 30-46). Considering that '160 discloses that the reinforcing substrate may comprise as little as 0.33% auxiliary filaments, it appears that '160 teaches or at least suggests that the yield may be 20% or less of the yield of the reinforcing yarns. It is also noted that '160 discloses that the quantity of reinforcing filaments may be varied based on the desired strength (column 3, lines 48-56). Therefore, in the event that it is shown that '160 does not specifically teach or suggest the claimed yield, it would have been obvious to one having ordinary skill in the art at the time the invention was made to vary the yield, such as to 20% or less of the yield of the reinforcing yarns, because the yield directly affects the strength of the substrate and because it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art.

Regarding claim 17, '160 discloses that the weft-direction auxiliary yarn group may be disposed on each surface of the substrate (see Figures 1-4).

Regarding claim 22, '160 does not specifically mention the claimed properties, but considering that the reinforcing fiber substrate taught by the applied prior art is substantially identical to the claimed reinforcing fiber substrate (unidirectional reinforcing fiber structure comprising warp and weft auxiliary yarns aligned in a specific orientation in a specific amount and also comprising resin in a specific shape and in a specific amount), it appears that if the

composite reinforcing fiber volume fraction was 53 to 65% it would inherently possess the claimed properties.

Regarding claim 46, '160 discloses that the thermosetting resin may be epoxy resin (column 8, lines 18-23).

9. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 4,320,160 to Nishimura in view of USPN 4,906,506 to Nishimura in view of USPN 5,649,398 to Isley in view of USPN 3,881,522 to Lewis in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol as applied to claims 15-17, 22 and 46 above, and further in view of USPN 5,132,394 to Bockrath.

'160 does not specifically mention a sizing agent, but Bockrath discloses that it is known in the reinforcing fiber fabric art to apply a sizing agent to fibers to facilitate the weaving process and to avoid or minimize loss of fiber properties (see entire document including column 10, lines 29-38). It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply a sizing agent to the auxiliary fibers, because the sizing agent would facilitate the weaving process and would avoid or minimize loss of fiber properties.

10. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over USPN 4,320,160 to Nishimura in view of USPN 4,906,506 to Nishimura in view of USPN 5,649,398 to Isley in view of USPN 3,881,522 to Lewis in view of anyone of USPN 5,852,108 to Yamanaka, USPN 5,360,669 to Noland, or USPN 4,854,988 to Voirol as applied to claims 15-17, 22 and 46 above, and further in view of USPN 5,071,711 to Heck.

'506 discloses that the resin material may be studded on a surface of the reinforcing fiber substrate (column 8, line 66 through column 10, line 34 and Figures 11-77), but '506 does not specifically mention the diameter of the studded resin material. Considering that '506 discloses that the fibers may have a diameter of up to 0.86 mm (column 4, lines 26-41), and considering that the studded resin material is illustrated as having a diameter less than the diameter of the fibers (Figures 11-77), it appears that '506 teaches or at least suggests that the studded resin material may have a diameter of less than 1 mm.

'506 is silent with regards to the studded resin mean height, therefore, it would have been obvious to look to the prior art for conventional resin heights. Heck provides this conventional teaching showing that it is known in the reinforcing fiber substrate art to use a resin height of from about 5 to about 80 microns (see entire document including column 3, lines 14-22). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to make the studded resin height from about 5 to about 80 microns motivated by the expectation of successfully practicing the teachings of '506.

Response to Arguments

11. Applicant's arguments filed 5/14/2007 have been fully considered but they are not persuasive.

The applicant asserts that there is no motivation to combine Isley with the other references. The examiner respectfully disagrees. The above rejections clearly set forth motivation to combine references.

The applicant asserts that there is no motivation to combine Yamanaka, Noland, or Voirol with '506. The examiner respectfully disagrees. The substitution of known equivalent structures involves only ordinary skill in the art. *In re Fout* 213 USPQ 532 (CCPA 1982); *In re Susi* 169 USPQ 423 (CCPA 1971); *In re Siebentritt* 152 USPQ 618 (CCPA 1967); In re Ruff 118 USPQ 343 (CCPA 1958). When a patent claims a structure already known in the prior art that is altered by the mere substitution of one element for another known in the field, the combination must do more than yield a predictable result. **KSR v. Teleflex**

The applicant asserts that '506 teaches away from using one of the claimed thermoplastic materials. The examiner respectfully disagrees. The current specification teaches that the thermoplastic resin is preferably similar to the thermosetting resin (page 27, second paragraph) while '506 similarly discloses that the thermoplastic resin should melt at about the same temperature as the matrix thermosetting resin (paragraph bridging columns 3 and 4).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew T. Piziali whose telephone number is (571) 272-1541. The examiner can normally be reached on Monday-Friday (8:00-4:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Terrel Morris can be reached on (571) 272-1478. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

6/18/07

atp

ANDREW PIZIALI
PRIMARY EXAMINER